UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/806,626	04/02/2001	Siu-Wai Wu	GIC-551	3330

7590 02/03/2004

Barry R Lipsitz
755 Main Street Building No 8
Monroe, CT 06468

EXAMINER	
VO, TUNG T	

ART UNIT	PAPER NUMBER
2613	5

DATE MAILED: 02/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/806,626	WU, SIU-WAI	
	Examiner	Art Unit	
	Tung T. Vo	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 07/05/01 has been considered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 16 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakazawa (US 5,550,590).

Re claims 16 and 28, discloses an apparatus for carrying out a method (fig. 7) of controlling the rate (6 of fig. 7) at which data is processed by a digital video encoder using a plurality of parallel compression engines (1a...1n of fig. 7) to compress successive macroblocks of video data, comprising the step of providing macroblock level rate control (21 of fig. 2; and 6 of fig. 7) in accordance with a rate control interrupt service routine a plurality of times per coded picture as the video data is being compressed at the respective compression engines (figs. 8-12).

4. Claims 1, 16-18, and 27-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Peterson (US 5,986,712).

Re claims 1, 16-17, 27-30, Peterson discloses an apparatus for carrying out a method for controlling (301 of fig. 3) the quantization in a digital video encoder that comprises a plurality of parallel compression engines (311 of fig. 3), wherein the global rate controller (301 of fig. 3) comprising the steps of: determining a target quantization level for a video frame (301 of fig. 3); wherein the video frame is represented by a plurality of panels, each panel comprises a plurality of slices, and each panel is processed in parallel by a respective one of the compression engines (311 of fig. 3); encoding the first slice of each panel in accordance with said target quantization level (311 of fig. 3); and encoding subsequent slices in each panel in accordance with a quantization level that is allowed to vary from said target quantization level until the last slice of each panel is reached (320, 301 of fig. 3); wherein the quantization level used for encoding the last slice of each panel is driven toward said target quantization level (310 of fig. 3).

5. Claims 16-18, and 28-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Hurst, Jr. (US 5,731,837).

Re claims 16 and 28, Hurst discloses an apparatus for carrying out a method (fig. 1) of controlling the rate at which data is processed by a digital video encoder using a plurality of parallel compression engines (10 of fig. 1) to compress successive macroblocks of video data, comprising the step of providing macroblock level rate control (21, 28 of fig. 1) in accordance with a rate control interrupt service routine a plurality of times per coded picture as the video data is being compressed at the respective compression engines (RLC and VLC, 15 of fig. 1)).

Re claims 17 and 30, Hurst further discloses means for adjusting the quantizer scale at interrupts of the rate control interrupt service (28' of fig. 7).

Re claims 18 and 29, Hurst further discloses the step of providing frame level rate control (37 of fig. 7) on successive video frames in accordance with a picture start interrupt service routine once per coded picture.

6. Claims 1-12, 16-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Borgwardt et al. (US 5,949,490).

Re claim 1, Borgwardt discloses a method for controlling the quantization in a digital video encoder that comprises a plurality of parallel compression engines (figs. 4-6), wherein the master controller (fig. 6) comprising the steps of: determining a target quantization level for a video frame (**DETERMINE RAT FOR CURRENT FRAME** of fig. 6); wherein the video frame is represented by a plurality of panels, each panel comprises a plurality of slices, and each panel is processed in parallel by a respective one of the compression engines (**BASED ON COMPLEXITY VALUES DETERMINE RATE FOR EACH SLICE** of fig. 6); encoding the first slice of each panel in accordance with said target quantization level; and encoding subsequent slices in each panel in accordance with a quantization level that is allowed to vary from said target quantization level until the last slice of each panel is reached (**PASS SET OF SLICES TO CLIENTS TO ENCODE USING MICRO RATE CONTROL IN PARALLEL** of fig. 6); wherein the quantization level used for encoding the last slice of each panel is driven toward said target quantization level (**LAST SET OF SLICES** of fig. 6.). See also col. 3, line 1 through col. 4, line 37.

Re claim 2, Borgward further discloses wherein said driving step uses piecewise linear feedback (RATE of fig. 1, and MASTER CONTROL of fig. 6) to drive the quantization level of the last slice of each of said image panels toward said target quantization level.

Re claim 3, Borgward further discloses wherein said feedback avoids abrupt variations in the quantization level between the first and last slice of each of said image panels (ABRUPT CHANGE ? of fig. 4).

Re claim 4, Borgward further discloses wherein a group of pictures (GOP) target bit rate is adjusted based on a number of film pictures and non-film pictures currently in a processing pipeline of at least one of said compression engines (FOR CURRENT GOP-START of fig. 6; MPEG/JPEG of fig. 4).

Re claim 5, Borgward further discloses wherein a higher target bit rate is provided for non-film pictures (ALTER TARG. R(n) FOR VBV VIOLATION of fig. 4, and MASTER CONTROLLER of fig. 6 and 5 can be adjusted for higher target bit rate for JPEG OR MPEG, non-film pictures or film pictures).

Re claim 6, Borgward further discloses the quantization level used for encoding-the last slice of each panel is driven toward said target quantization level such that the first slice and the last slice of each panel are encoded in accordance with approximately the same quantization level (LAST SET OF SLICES of fig. 6, see also col. 3, lines 8-19).

Re claim 7, Borgward further discloses a buffer level of said video encoder is used to control the start of a new group of pictures (GOP) (SLICE COMPLETE, VBV

CHECK, OK, CURRENT MACROBLOCK = NEXT MACROBLOCK of fig. 7; col. 4, lines 39-53).

Re claim 8, Borgward further discloses wherein said panels are simultaneously compressed at the respective compression engines during a frame time (col. 4, lines 19-37; CLIENT ENCODERS of fig. 5).

Re claim 9, Borgward further discloses wherein the compressed panel data are stored locally at the compression engines for subsequent transfer to a video buffer of the video encoder within a next frame time (STORAGE of fig. 5).

Re claim 10, Borgward further discloses wherein data are retrieved from said buffer, to form a transport packet, at an average rate equal to a specified video bit rate whenever the buffer has at least one transport packet payload's worth of data (col. 3, lines 19-31).

Re claim 11, Borgward further discloses wherein null packets are substituted for video packets to maintain a constant transport bit rate whenever said buffer level falls below one transport packet payload's worth of data (col. 3, lines 23-31).

Re claim 12, Borgward further discloses wherein a reference quantizer scale is calculated for each of said compression engines (col. 4, lines 9-13).

Re claims 16 and 28, Borgward further discloses an apparatus for carrying out a method (fig. 6) of controlling the rate at which data is processed by a digital video encoder using a plurality of parallel compression engines (MASTER CONTROLLER, CLIENTS of fig. 5) to compress successive macroblocks of video data, comprising the step of providing macroblock level rate control in accordance with a rate control interrupt service routine a plurality of times per coded picture as the video data is being compressed at the respective compression engines (cols. 3, line 1 through col. 4, line 53).

Re claims 17 and 30, Borgward further discloses means for adjusting the quantizer scale at interrupts of the rate control interrupt service (MASTER CONTROLLER of fig. 6, e.g. the master controller updates the target rate and the quantizer scale for the next set of slices within a frame, wherein the frame is within a GOP).

Re claims 18 and 29, Borgward further discloses the MASTER CONTROLLER of fig. 6 further comprises step of providing frame level rate control (TARGET RATE CONTROL for FRAME) on successive video frames in accordance with a picture start interrupt service routine once per coded picture.

Re claim 19, Borgward further discloses wherein said picture start interrupt routine updates frame level statistical variables by processing data collected from a prior coded frame (col. 4, lines 24-37).

Re claim 20, Borgward further discloses comprising the further step of calculating a target bit rate for a new group of pictures (GOP) if a new frame to be processed comprises an intra-coded (I) frame (fig. 6, for a new I frame; see also fig. 2).

Re claim 21, Borgward further discloses calculating upper and lower limits on the number of bits that a new frame is allowed to generate for every frame to be encoded (THE FRAME IS DIVIDED INTO MACROBLOCKS, THE MACROBLOCKS ARE DIVIDED INTO SLICES, AND EACH FRAME, MACROBLOCK, OR SLICE IS CACULATED TO PROVIDE NUMBER OF BITS RATE FRO UPPER AND LOWER LIMITS); and computing a target number of bits to be generated for each frame and for each of a plurality of panels into which each frame is divided (THE MASTER CONTROLLER CALCULATED THE TARGET BITS FOR FRAMES, MACROBLOCKS, AND SLCICES of fig. 6).

Re claim 22, Borgward further discloses wherein said target number of bits is computed by distributing the bits in proportion to relative complexity values of the video frames being processed (col. 4, lines 1-52).

Re claim 23, Borgward further discloses wherein said rate control interrupt service routine provides interrupts as the video data is being compressed at the respective compression engines which initiate a modulation of a frame target quantizer scale, said modulation being based on feedback to attempt to bring the actual number of bits for each of said panels to the corresponding target number of bits for the panel (col. 3, lines 59 through col. 4, line 17).

Re claim 24, Borgward further discloses comprising the further step of calculating a frame target quantizer scale from the target number of bits computed for a frame (DETERMINE RATE FOR GOP AND FOR CURRENT FRAME of fig. 6).

Re claim 25, Borgward further discloses wherein said frame target quantizer scale is provided to each of said plurality of compression engines as an initial reference quantizer scale for use in commencing coding of the video frame (col. 4).

Re claim 26, Borgward further discloses wherein said macroblocks comprise DCT coefficients (DCT of fig. 1), said method comprising the further step of enabling said compression engines to force some of said DCT coefficients to zero (the zero coefficients) if said reference quantizer scale is too high to maintain the number of bits that the new frame is allowed to generate within said upper limit (where the upper limits of coefficients are generated).

Re claim 27, Borgward further discloses an apparatus (MASTER CONTROLLER of figs. 5 and 6) for controlling the quantization in a digital video encoder that comprises a plurality of parallel compression engines, comprising: means for determining a target quantization level for a video frame (fig. 6); wherein the video frame is represented by a plurality of panels, each panel comprises a plurality of slices, and each panel is processed in parallel by a respective one of the compression engines (col. 4, lines 1-52); means for encoding the first slice of each panel in accordance with said target quantization level (CLIENT of fig. 4, fig. 7); and means for encoding subsequent slices in each panel in accordance with a quantization level that is allowed to vary from said target quantization level until the last slice of each panel is reached (fig. 7); and means for driving the quantization level at the last slice of each of said image panels toward said target quantization level (MASTER CONTROLLER of figs. 5 and 6, AN EXAMPLE, RATE of fig. 3).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borgwardt et al. (US 5,949,490) in view of Ben-Arie et al. (US 5,946,039).

Re claims 13-15, Borgwardt further teaches wherein the compression engine modifies its reference quantizer scale based on a local buffer fullness to generate a final quantizer scale value for use in quantization (fig. 7, VBV CHECK and VBV EMERGENCY ACTION), wherein a panic mode (VBV EMERGENCY ACTION of fig. 7) is initiated by the compression engine if the final quantizer scale value is higher than a predetermined maximum value, said panic mode maintaining the quantization at or below said predetermined maximum value.

It is noted that Borgwardt does not teach an accumulation of quantizer scale values for that compression engine (sum quant);an accumulation of the number of bits generated on that compression engine (bitcount);an accumulation of the number of macroblocks processed on that compression engine (MBcount); and a fullness level of a video buffer of the video encoder (buffer level).

However, Ben-Arie teaches an accumulation of quantizer scale values for that compression engine (sum quant) (figs. 5-6) ;an accumulation of the number of bits generated on that compression engine (bitcount) (486 of fig. 8); an accumulation of the number of macroblocks processed on that compression engine (MBcount) (fig. 7); and a fullness level of a video buffer of the video encoder (buffer level) (MEM 0-MEM4 of figs. 7 and 10).

Taking the combined teachings of Borgwardt and Ben-Aries as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the teachings of Ben-Arie into the system Borgwardt for the same purpose of accumulating the quanitzation

level (scale) , number of bits, macroblocks and fullness of the buffer. Doing so would reduce time of computations to improve the encoding efficiency.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kutner (US5,489,943) discloses one-pass adaptive bit rate control.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tung T. Vo whose telephone number is (703) 308-5874. The examiner can normally be reached on 6:30 AM - 3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris. Kelley can be reached on (703) 305-4856. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

TUNG T VO
PATENT EXAMINER

Tung T. Vo
Examiner
Art Unit 2613

T.Vo